

## WHAT IS CLAIMED IS:

1 1. A waveguide device which acts as a waveguide in at least one  
2 direction thereof; the device comprising:

3 a core having a pump input surface for receiving pumping radiation  
4 at a pumping wavelength and at least one output surface for emitting a laser beam  
5 at an output wavelength; and

6 means for providing pump-light confinement and means for providing  
7 output mode control in different sections of the device along the direction of beam  
8 propagation.

1 2. The device as claimed in claim 1 wherein the core is a single  
2 member.

1 3. The device as claimed in claim 1 wherein the core includes  
2 an active core member and a passive core member.

1 4. The device as claimed in claim 1 wherein the means for  
2 providing pump-light confinement includes a pump-light confinement component in  
3 contact with a surface of the core in a pumping section of the device.

1 5. The device as claimed in claim 4 wherein the pump-light  
2 containment component is a pump cladding.

1 6. The device as claimed in claim 1 wherein the means for  
2 providing output mode control includes a coating in contact with the core.

1 7. The device as claimed in claim 5 wherein the means for  
2 providing output mode control includes a mode control cladding in contact with the  
3 core.

1 8. The device as claimed in claim 1 wherein the means for  
2 providing output mode control includes a grating in contact with the core.

1 9. The device as claimed in claim 1 wherein the core is a planar  
2 core.

1 10. The device as claimed in claim 1 wherein the core is a  
2 cylindrical core.

1 11. The device as claimed in claim 1 further comprising a  
2 substrate for supporting the core.

1 12. The device as claimed in claim 1 wherein the device is a laser.

1 13. The device as claimed in claim 12 wherein the laser is a  
2 planar waveguide laser.

1 14. The device as claimed in claim 1 wherein the core has laser  
2 input surface for receiving a source laser beam to be amplified and wherein the  
3 device is an optical amplifier.

1 15. The device as claimed in claim 14 wherein the core is planar  
2 and wherein the optical amplifier is a planar waveguide amplifier.

1 16. The device as claimed in claim 14 wherein the laser input  
2 surface is different from either the pumping input surface or the at least one output  
3 surface.

1 17. The device as claimed in claim 14 wherein the laser input  
2 surface is the same as the at least one output surface.

1 18. The device as claimed in claim 1 wherein an output mode  
2 control section of the device has a lower NA than a pumping section of the device.

1 19. The device as claimed in claim 18 wherein the pumping  
2 section has a NA greater than 0.05.

1 20. The device as claimed in claim 18 wherein the output mode  
2 control section has a NA less than 0.22.

1 21. The device as claimed in claim 9 wherein the planar core  
2 includes doped YAG.

1 22. The device as claimed in claim 5 wherein the pump cladding  
2 has a lower refractive index than the refractive index of the core.

1 23. The device as claimed in claim 22 wherein the pump cladding  
2 is sapphire or undoped YAG.

1 24. The device as claimed in claim 7 wherein the mode control  
2 cladding includes a material having a refractive index between that of the core and  
3 that of the pump cladding.

1 25. The device as claimed in claim 24 wherein the mode control  
2 cladding includes doped or undoped YAG.

1 26. The device as claimed in claim 9 wherein the planar core  
2 includes a first core member which absorbs the pumping radiation and a separate  
3 second core member which either does not absorb the pumping radiation or has an  
4 absorption lower than the absorption of the first core member at the pumping  
5 wavelength.

1 27. The device as claimed in claim 9 wherein the device acts as  
2 a pair of separate waveguides which are butt-coupled or coupled together by an  
3 imaging system.

1 28. The device as claimed in claim 18 wherein the device is an  
2 optical fiber.

1 29. The device as claimed in claim 28 wherein the means for  
2 providing output mode control includes a mode control cladding different from the  
3 pump cladding.

1 30. The device as claimed in claim 29 wherein the device  
2 comprises sections of different types of fiber which are either spliced, butt-coupled  
3 or coupled together by imaging an output from one section into the other section.

1 31. A method for generating a laser beam having a desired output  
2 mode, the method comprising:

3 providing a core having a pump input surface and at least one output  
4 surface, the core serving as a waveguide in at least one direction;

5 pumping the core at the pump input surface with pumping radiation  
6 at a pumping wavelength so that an output laser beam is emitted at the at least one  
7 output surface at an output wavelength; and

8 separating the functions of pump-light confinement and output mode  
9 control to different sections along the length of the waveguide.

1 32. The method as claimed in claim 31 wherein the core has a  
2 laser input surface and wherein the method further comprises transmitting a source  
3 laser beam into the core at the laser input surface wherein the source laser beam is  
4 amplified within the core and wherein the output beam is an amplified source laser  
5 beam.

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